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ABSTRACT

This study examined children's conflict interactions in an attempt to provide evidence for the evolutionary continuity of the organization of power relations within primate societies and childhood peer groups. A total of 17 children, ages 3 - 5, were observed daily at their preschool over a three month period. Two one-half hour video samples were taken each day and the naturally occurring conflict in these video records was analyzed to assess dominance relations. The results indicated that the data collected from observations in this study correspond very closely to the linear dominance model which applies to the group behavior of primates. (JMB)

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An Ethological Analysis of Dominance Relations Among Young Children*

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Social Dominance Among Young Children

Dyadic dominance relations and group dominance hierarchies are traditional concepts in primate social ethology (Crook, 1970; Hinde, 1974; Jolly, 1972; Kummer, 1971). Dyadic dominance describes the relative balance of social power between specific members in a social group, while dominance structures summarize the organization of such power relationships among all possible group members. Social dominance has been viewed as a basic dimension of primate social organization which relates to a number of other social processes -- e.g., group defense (Jolly, 1972); reaction to strangers (Ripley, 1967); social learning (Hall, 1968; Strayer, in press); social innovation (Frisch, 1968; Tsumori, 1967); social play (Dolhinow & Bishop, 1972), and to general reorganization of the social unit (Furuya, 1960; Sugiyama, 1965).

Theoretically, the existence of dyadic dominance and the maintenance of a stable dominance hierarchy function to minimize intra-group aggression by establishing a semi-permanent sequence of individual prerogatives (Etkin, 1964; Hinde, 1974). Having learned the appropriate power sequence for its social unit, each group member is able to anticipate, and thus to avoid, immediate adverse consequences of severe social aggression. In spite of general theoretical agreement concerning the adaptive significance of both dominance relations and dominance hierarchies, the empirical application of these concepts in comparative research has been problematic (Bernstein, 1970; Hinde, 1974; Richards, 1974). A recurrent issue in such research has been the development of a standard methodology which can be applied to a variety of primate species. Essentially, this problem entails specification of an adequate cross-species operational definition of social dominance.

Many earlier researchers attempted to assess primate dominance in terms of a single type of social interaction. Often such interactions consisted of artificial competitions in a controlled setting. Unfortunately, such unidimensional indices of dominance proved inadequate because results failed to generalize to other more natural social settings. In more recent primate research, dominance has been reserved as a general descriptive concept which summarizes recurrent group patterns for the resolution of naturally occurring social conflict -- i.e., social agonism (Alexander & Bowers, 1969; Bernstein, 1970; Hinde, 1974; Strayer, Bovenkerk & Koopman, 1975). This use of social dominance necessitates the identification of specific behavioural patterns which characterize agonistic episodes between members of the species studied. Finally this descriptive approach stresses analysis of responses to initiated agonism as one of the primary indices of relative dyadic dominance (Rowell, 1966).

Given the apparent importance of both dyadic dominance relations and group dominance structures for understanding naturally occurring primate behaviour, it is surprising that these ethological concepts have been extended only recently to the analysis of human social relations. In one of the earliest attempts to relate primate and human dominance, Edelman and Omark (1973) developed a social hierarchy questionnaire to examine perception of dyadic social power among young children. These investigators questioned children of different ages about the relative "toughness" of selected pairs of classmates. In each group examined, the children's verbal reports revealed sufficient communality in the perception of dyadic social power to permit the identification of a single rank ordering on the dimension of "toughness". More recently, cross-cultural extensions of this

research have led these authors to conclude that a typical primate linear hierarchy provides an adequate summary of young children's power relations within the peer group (Omark, Omark & Edelman, in press; Omark & Edelman, in press).

In a more traditional ethological study of characteristic behavioural patterns among pre-school children, McGrew (1972) provided a preliminary behavioural analysis of human dominance relations. His assessments of dyadic dominance were derived from naturalistic observation of wins and losses during conflict over the possession of preferred objects. McGrew reported a nearly linear dominance structure among the boys in his pre-school samples. This finding only partially corroborates reports of sexually stratified dominance structures among young children (Omark, et al, in press).

In a more recent behavioural analysis, Strayer (1975) identified three general categories of naturally occurring social conflict -- Attacks, Threats, and Object/Position Struggles -- which could be used as converging indices of children's dominance relations. Naturalistic observation of such conflict among groups of preschool and elementary school children during free play periods revealed stable dyadic dominance relations and linear group status structures at both age levels. However, dominance appeared to be a more unitary social phenomenon among the older group of children, since only with this group did all three forms of conflict converge to yield a single linear dominance structure. In contrast, with the pre-school group, analysis of Attack and Threat interactions produced a single linear status structure, but this structure did not correspond with rankings derived from analysis of Object/Position Struggles. These latter

findings suggest possible ontogenetic trends in the development of human dominance relations. Among the younger children, status rankings may be interaction specific; and, only after more extended experience with the peer-group would these different structures converge to produce a single group dominance hierarchy. Finally, an important discrepancy between this latter study and earlier findings on human dominance, is an apparent lack of extreme sexual stratification in group status rankings. In both the groups observed by Strayer, a female was the most dominant child.

These preliminary studies suggest that there may be structural similarity in the organization of power relations within primate societies and childhood peer-groups. However, more definitive evidence for such evolutionary continuity requires a more extensive examination of children's conflict interactions. The present research was designed to provide such an analysis through the development of a more fine-grained social agonism inventory. Since our earlier work suggested the lack of a unitary dominance structure among pre-school children we decided to focus at this age level in order more clearly to identify possibly different status structures for the resolution of different types of social conflict.

Method

Subjects

Eighteen children between the ages of three and five years were observed daily at their pre-school over a three month period. Systematic observations and video records were obtained for the last six weeks of this period on 17 children, since one girl had terminated her enrollment at the centre.

Procedure

Dominance relations were assessed through analysis of videorecords of naturally occurring conflict. Two 1/2 hour video samples were collected each day. Data were collected using a matrix-completion method. This method attempts to obtain data on as many dyads within the group as possible, in order to provide representative behavioural episodes for each dyad, rather than to estimate actual rates of conflict (Altmann, 1974). The social agonism inventory was developed from repeated observation of videotaped episodes of social conflict collected during the initial six weeks of observation. Preliminary analyses resulted in the elaboration of the behavioural coding framework previously used by Strayer (1975). In the revised behavioural inventory the Physical Attack category was subdivided into six specific forms of initiated agonism: Bite, Chase, Hit, Kick, Push-pull, and Wrestle. The Threat Gesture category was comprised of four specific patterns: Intention Hit, Intention Kick, Intention Bite, and Face/Body Posture. Finally, two forms of Object/Position Struggles were distinguished: Displace with physical contact, and Displace without contact.

In addition to these forms of initiated agonism, five general categories of responses to initiated agonism were identified: Submission, Help-Seeking, Counter-Attack, Object-Loss, and No-Response. Submission consisted of seven specific appeasement gestures: Cry, Scream, Rapid Flight, Cringe, Hand-Cover, Flinch, Withdraw, and Requests Cessation. Help seeking was distinguished in terms of the target - Seeks Child's Help, or Seeks Adult Help. Counter-attacks included any response which could be scored as a form of initiated agonism. The categories of Object/Position

Loss and No-Response were not subdivided.

All episodes of social agonism were scored noting the initiator, target, pattern of initiation and response of the target. If an episode consisted of an extended sequence including a number of counter-attacks, each act was scored separately but the sequence was kept intact by noting the number of exchanges it entailed. Interactions were scored only if both their initiation and termination appeared in the video record.

Results and Discussion

Observed Social Agonism

During the last six weeks of systematic observation, 443 agonistic episodes were recorded. Table 1 shows both the total and relative frequency of occurrence for each category and pattern of initiation included in the present agonism inventory. Nearly 40% of the agonistic episodes entailed some form of Physical Attack. Two patterns - Hit and Push-Pull, accounted for over three quarters of attack interactions. Threat Gestures were the second most frequent type of initiated agonism. Approximately a third of the observations were scored in this category. Once again, two patterns - Intention Hit and Face & Body Posture - accounted for over three quarters of the observations. Slightly more than a quarter of all observations entailed Object/Position Struggles. However, with this final type of conflict there were only marginal differences between the category subdivisions.

Responses to initiated agonism are summarized in Table 2. Seeking help occurred at a surprisingly low frequency - only on four occasions did the victim of an agonistic episode seek external support. It is

interesting that on each of these occasions help was sought from one of the daycare teachers, and not from another member of the peer-group. Three of the remaining response categories - submission, Object/Position Loss, and No-Response - each comprised about a quarter of the observed responses. Flinch was the most frequent submissive gesture; most of the remaining submissive patterns, with the exception of Request Cessation, each accounted for about 10 to 15% of the acts scored in this category. The low frequency of verbal submission was a surprising finding, since all of the children were quite able to engage in conversations. Slightly more than one in five agonistic episodes involved a counter-attack by the victim, or target. The majority of such counter-attacks were scored in the Threat Gesture category. Often if an initiated act led to a counter-attack, the agonistic episode would run into a more extended sequence with each member of the dyad countering attacks by the other. Such lengthy sequences almost always ended with one individual engaging in a submissive act. In contrast, initiated acts which led to No-Response by the target were usually short in duration, often consisting of the single dyadic exchange.

The above summaries give some preliminary indication of the specific nature of dyadic conflict transactions among this age group. However, the reported frequencies should be interpreted somewhat cautiously, since the present sampling technique was selected to maximize the derivation of a group dominance matrices, rather to provide accurate estimates of behavioural events. Our general feeling was that differences in our observations reflect actual differences in relative frequencies of specific acts, but confirmation of this hunch awaits analysis of data collected using individual (or focal) event samples (Altmann, 1974).

Dyadic Dominance Relations

Subsequent analyses of the present data focused exclusively upon dyadic agonistic interactions. These analyses were designed to assess the degree to which our observations corresponded to a linear dominance model. The appropriateness of this model as a summary of group patterns for conflict resolution can be evaluated in terms of the percentage of observed dyadic dominance relations which correspond to the linear transitivity rule. This rule states that if individual A dominates B, and individual B dominates C, then A should also dominate C. Characteristically, within many primate groups, close to 100% of observed dominance relations correspond to this rule (Alexander & Bowers, 1967; Richards, 1974; Strayer, in press; Strayer, et al, 1975).

Once having determined the appropriateness of the linear model, a second common question concerning status structures focuses upon the rigidity of the revealed dominance hierarchy. Rigidity of dominance roles is usually assessed in terms of the number of agonistic episodes which violate established dominance relations. Thus in a group where one member of each possible dyad wins all agonistic encounters, the status structure would be completely rigid. In a second group where determination of relative dyadic dominance for each pair was based upon winning only 51% of total dyadic interactions, the status structure would be almost completely fluid.

Figure 1 illustrates the dyadic frequency of interaction for all 17 children in the present sample. Inspection of this dyadic matrix reveals that agonistic interactions in the group were definitely not unidirectional. For example, although RO and SS each initiate the majority of dyadic agonism

with IF, IF also directs agonistic acts toward RO and SS. In this particular matrix, nearly 25% of the initiated acts lie below the diagonal of the matrix. Figure 2 shows only those initiated acts which led to Counter-Attacks and No-Responses. If these observations are eliminated from the complete set of observations, a matrix comprised only of agonistic acts leading to submission remains. This matrix is shown in Figure 3. This latter matrix begins to resemble a dominance hierarchy. Nearly 60% of the possible dyads in the group were observed to engage in agonism-submission interactions. Given these 75 dyads, only six show dominance reversals which violate the linear transitivity rule. Thus this particular dominance structure would be nearly 92% linear at the relations level. Of the 230 agonistic acts in Figure 3, 33 indicate violations of the dominance ranking (i.e, 33 initiated acts are below the diagonal of the matrix). Thus, the rigidity index of this particular status structure based upon Attacks, Threats, and Objects/Position Struggles leading to Submission or Object/Position Loss is 86%.

Figure 4 shows only Object/Position Struggles that resulted in Object/Position Loss. Approximately 40% of the total possible dyads engaged in this type of conflict. There were again six violations of the linear model rule; thus this object position status ranking is only 88% linear. With regard to rigidity of this structure, there were 21 episodic reversals in the Figure 4 matrix. Thus, only about 76% of these interactions are predicted by the current rank ordering of children.

Figure 5 shows Physical Attack and Threat Gesture interactions which led to submission by the target child. Here, 45% of the dyads engaged in this type of conflict. There are two instances in which observed dominance

relations violate the linear model rule. Thus the Attack-Threat Status Structure is 98% linear. Of the 141 interactions summarized in Figure 5, only 12 represent episodic reversals of dyadic dominance. Thus the status ranking in this figure is about 94% rigid.

Finally examination of those Attack interactions which produced Submission by the target child reveals the status structure shown in Figure 6. Here, 30% of the possible dyads engaged in the specified type of interaction. There were no violations of the linear dominance rule for any of the 51 dyads observed to initiate such Attack behaviour. Thus, this status ranking is perfectly linear at the relational level. With regard to rigidity of the Attack ranking, there were only three episodic reversals of initiated agonism. Thus, this particular matrix is nearly 96% rigid.

Examination of the relative linearity and rigidity of status rankings based upon the three forms of initiated agonism led to the retention of Physical Attacks and Threats Gestures as primary behavioural indices of social dominance among young children. The resulting group dominance hierarchy is shown in Figure 7. Such behavioural indices of initiated agonism correspond quite well with dominance indices used among many non-human primates. Perhaps more importantly, the selection of only those initiated acts which led to clearly submissive reactions in the target child provides a striking parallel with Rowell's (1966) work on captive baboon . This emphasis upon submission during social conflict is prerequisite to an adequate distinction between dyadic dominance (or even dominance status) and individual aggressiveness. For example, RO - the alpha girl in Figure 7 - elicits submission from her peers on only five occasions. This contrasts sharply with the relatively greater initiation score of GL - a more submissive

low ranking boy. Also it is interesting to note the two relational reversals in this final Dominance Structure. Both of these reversals involve a close friend of RO, and were scored in the Threat Gesture category. These two observations provide the only indication of possible interaction between affiliative and power dimensions in the present pre-school sample.

Before closing, it seems relevant to draw attention to our original finding that analysis of Object/Position Struggles seem to yield slightly different status rankings for very young children. This finding directly parallels developmental differences in status rankings recently reported among captive Saimiri (Smith, Rhodes & Strayer, 1975). It seems that young squirrel monkeys are able to displace and steal from more dominant group members with relative impunity. A decrease in the rigidity of dominance relations to permit such unorthodox behaviour may well have important functional significance in that it facilitates exploration of the physical and social environment at a time when the young animal must acquire extensive practical knowledge. Perhaps the slight discrepancy in status rankings at the pre-school level reflects a particular time in development when similar impunity begins to wane among young children.

References

Alexander, B.K., & Bowers, J.M. The social organization of Japanese monkeys in a two-acre enclosure. Folia Primatologica, 1969, 10, 220-242.

Altmann, J. Observational study of behavior: sampling methods. Behavior, 1974, XLIX, 227-265.

Bernstein, I.S. Primate status hierarchies. In L.A. Rosenblum (Ed.), Primate behavior: developments in field and laboratory research. New York: Academic Press, 1970. Pp. 71-111.

Crook, J.H. Social organization and the environmental aspects of contemporary social ethology. Animal Behavior, 1970, 18, 197-209.

Dolhinow, P.J., & Bischop, N. The development of motor skills and social relationships among primates through play. In P.J. Dolhinow (Ed.), Primate Patterns. New York: Holt, Rinehart, & Winston, 1972. Pp. 312-337.

Edelman, M.S., & Omark, D.R. Dominance hierarchies in young children. Social Science Information, in press.

Etkin, W. Social Behavior and Organization among Vertebrates. Chicago: University of Chicago Press, 1964. Pp. 1-35.

Frisch, J. Individual behavior and intertroop variability in Japanese monkeys. In Primates: Studies in Adaptation and Variability. P.C. Jay, (Ed.) New York: Holt, Rinehart and Winston, Inc., 1968. Pp. 243-252.

Furuya, Y. An example of fission of a natural troop of Japanese monkeys at Cagyusan. Primates, 1960, 2, 149-179.

Hall, K.R.L. Social Learning in monkeys. In P. Jay (Ed.), Primates: studies in adaptation and variability. New York: Holt. Rinehart, & Winston, 1968. Pp. 383-397.

Hinde, R.A. Biological Basis of Human Social Behavior. New York: McGraw Hill Book Co., (1974).

Jolly, A. The Evolution of Primate Behavior. New York: The MacMillan Press, (1972).

Kummer, H. Primate Societies: Group Techniques of Ecological Adaptation. Chicago: Aldine Publishing Co. (1971).

McGrew, W. An Ethological Study of Children's Behavior. New York: Academic Press, (1972).

Omark, D.R., & Edelman, M.S. The development of attention structures in young children. In M.R.A. Chance & R. Larsen (Eds.) Attention Structures. New York: John Wiley, in press.

Omark, D.R., Omark, M., & Edelman, M.S. Formation of dominance hierarchies in young children: attention and perception. In T. Williams (Ed.) Psychological Anthropology. The Hague; Monton Press, in press.

Richards, S.M. The concept of dominance and methods of assessment. Animal Behavior, 1974, 22, 914-930.

Ripley, S. Intertroop encounters among Ceylon gray langurs. In S.A. Altmann (Ed.), Social Communication among Primates. Chicago: University of Chicago Press, 1967, 237-254.

Rowell, T.E. Hierarchy in the organization of a captive baboon troop. Animal Behavior, 1966, 14, 430-443.

Smith, M., Rhodes, W., & Strayer, F.F. Dominance and status among captive squirrel monkeys: a systematic comparison of assessment techniques. Submitted for presentation at annual meeting of C.P.A., Quebec City, 1975.

Strayer, F.F. Preliminary investigations of social ecology among young children. Contribution to Symposium on Environmental Psychology at meeting of Ontario Psychological Association, 1975.

Strayer, F.F. Learning and imitation as a function of social status in macaque monkeys (Macaca nemestrina). Animal Behavior, in press.

Strayer, F.F., Bovenkerk, A., & Koopman, R.F. Dominance and affiliation in captive Squirrel monkeys (Saimiri sciureus). Journal of Comparative and Physiological Psychology, 1975, 89, 308-318.

Sugiyama, Y. On social change of Hanuman langurs in their natural condition. Primates, 1965, 6, 381-418.

Tsumori, A. Newly acquired behaviors and social interactions of Japanese monkeys. In S.A. Altmann (Ed.), Social Communication among Primates. Chicago: University of Chicago Press, 1967. Pp. 207-220.

TABLE 1

SUMMARY OF INITIATED AGONISM

BEHAVIOURS	FREQUENCY	PERCENT OF TOTAL
PHYSICAL ATTACK	173	39%
Chase	10	6%
Push-Pull	63	36%
Hit	80	46%
Kick	12	7%
Wrestle	6	3%
Bite	2	1%
THREAT GESTURES	146	33%
Face & Body Posture	49	34%
Intention Hit	76	52%
Intention Kick	19	13%
Intention Bite	2	1%
OBJECT/POSITION STRUGGLES	124	28%
Displace without Contact	60	48%
Displace with Contact	64	52%
TOTAL AGONISM	443	

TABLE 2

SUMMARY OF RESPONSES TO INITIATED AGONISM

BEHAVIOUR	FREQUENCY	PERCENT OF TOTAL
HELP-SEEKING	4	1%
Seeks Adult Help	4	100%
Seeks Child Help	0	0%
SUBMISSION	113	26%
Cry-Scream	12	10%
Rapid Flight	18	16%
Cringe	16	15%
Hand-Cover	11	9%
Flinch	35	31%
Withdrawal	16	15%
Requests Cessation	5	4%
OBJECT/POSITION LOSS	113	26%
NO RESPONSE	118	26%
COUNTER-ATTACK	95	21%
TOTAL RESPONSES	443	

Figure 1

TOTAL DYADIC AGONISM

TARGETS

INITIATORS

	Ro	Ss	Br	If	Td	Sd	Pe	Ir	Cs	Ka	Ch	Ty	Gl	Sa	Me	Ju	Sh	Tot.
Ro		1	3	4	1			1	1		1		7		1			20
Ss	1		7	8	2	1	1	12	3		1	1	4	1			2	44
Br	1	4		7	3	2	2		1		8	1	5	5			1	40
If	3	3	2		3	1	13	3	5	1			8	3		2	1	48
Td	1			3		4	6		8	5	1		1	3		2	1	35
Sd							2	8	11		4		4	3		1		35
Pe	1		1	9	3	4		2			1		7	9	1	1		39
Ir				1	1	1	2		7	5	1	1	1					20
Cs	1	1	1	2	5	11		3					1					25
Ka							1					11		1		1	4	18
Ch	4		4	3	3	2	1					3	11	5		2	2	40
Ty										2			2		8			12
Gl		1	9	3		3	6				11	2		1		7	5	48
Sa		1	4		1	2	1				1		1					11
Me												3						3
Ju						1						1	1					3
Sh									1	1								2
Tot.	12	11	31	40	22	32	36	30	37	14	29	23	53	32	9	16	16	443

Figure 2

AGONISM LEADING TO NO RESPONSE AND COUNTERS

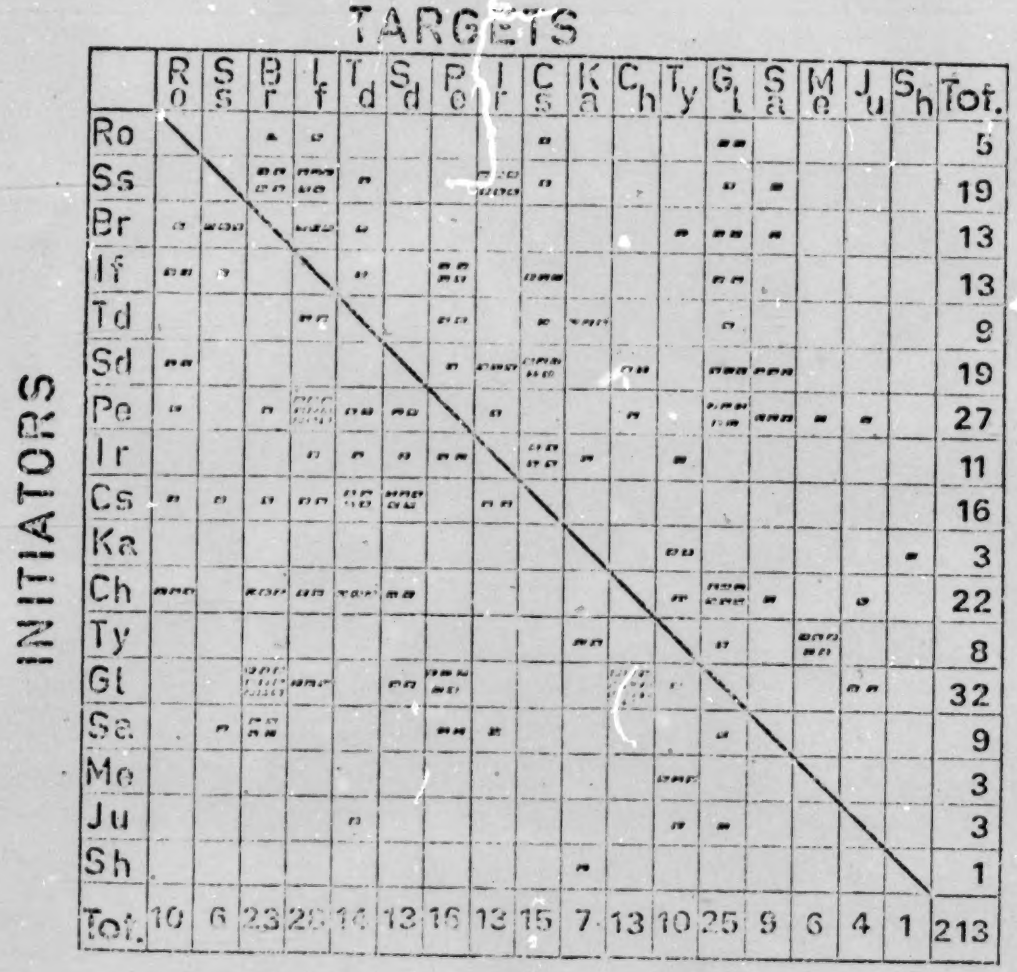


Figure 3

AGONISM LEADING TO SUBMISSION

TARGETS

INITIATORS

	Ro	Ss	Br	If	Td	Sd	Pe	Ir	Cs	Ka	Ch	Ty	Gl	Sa	Me	Ju	Sh	Tot.
Ro		1	2	3	1			1			1		3	2				15
Ss	1		4	3	1	1	1	3	2		1	1	3				2	25
Br		1		2	2	1			1		2		3	2			1	27
If	1	2	2		2	1	3	3	2	1			3	2		2	1	35
Td	1			1		2	3		3	2	1			2		2	1	26
Sd							1	3	3		2		1			1		16
Pe					1	X		1					2	3				12
Ir									2	2	1		1					9
Cs					1	3		1					1					9
Ka							X					3		1		1	3	15
Ch	1		1	X			X					2	3	2		1	2	18
Ty													1		3			4
Gl		1				1	1				1	1		1		3	3	16
Sa						X					1							2
Me																		0
Ju																		0
Sh									X									1
Tot.	4	5	8	12	8	17	20	17	22	7	16	13	28	23	3	12	15	230

Figure 4

OBJECT / POSITION STRUGGLES

TARGETS

INITIATORS

	Ro	Ss	Br	If	Td	Sd	Pe	Ir	Cs	Ka	Ch	Ty	Gl	Sa	Me	Ju	Sh	Tot.
Ro			-	----				-			-		--					10
Ss	x -		--			-	-	--	-		-						-	10
Br				----	-	-	--				--			--				11
If	-	x --	--				-	-					--	-				10
Td				x -		---	-				-			---		-	-	12
Sd								--	--				-					7
Pe						x --							-	---				6
Ir										--			-					3
Cs					x -	x --												5
Ka							x -											1
Ch	-		-				x -					--		-			-	7
Ty															-			1
Gl		x -				-								-		--		5
Sa																		0
Me																		0
Ju																		0
Sh									x -									1
Tot.	3	3	6	7	2	13	7	8	4	2	5	2	9	11	1	3	3	89

Figure 5

ATTACKS & THREATS

TARGETS

INITIATORS

	Ro	Ss	Br	If	Td	Sd	Fe	Ir	Cs	Ka	Ch	Ty	Gl	Sa	Me	Ju	Sh	Tot.
Ro		1	1		1								1	1				5
Ss			1	3	1			2	1			1	3				1	15
Br		1		1	1				1		4		3	2			1	16
If					2	1	3	2	2	1			2	2		2	1	25
Td	1						3		3	2						1		14
Sd							1	1	2	2						1		9
Fe					1			1					1	3				6
Ir									3	2	1							6
Cs						2		1					1					4
Ka												4		1		1	3	14
Ch				1									4	3		1	1	11
Ty													1		2			3
Gl							1				1	1				3	2	11
Sa						1					1							2
Me																		0
Ju																		0
Sh																		0
Tot.	1	2	2	5	6	4	13	9	18	5	11	11	19	12	2	9	12	141

Figure 6

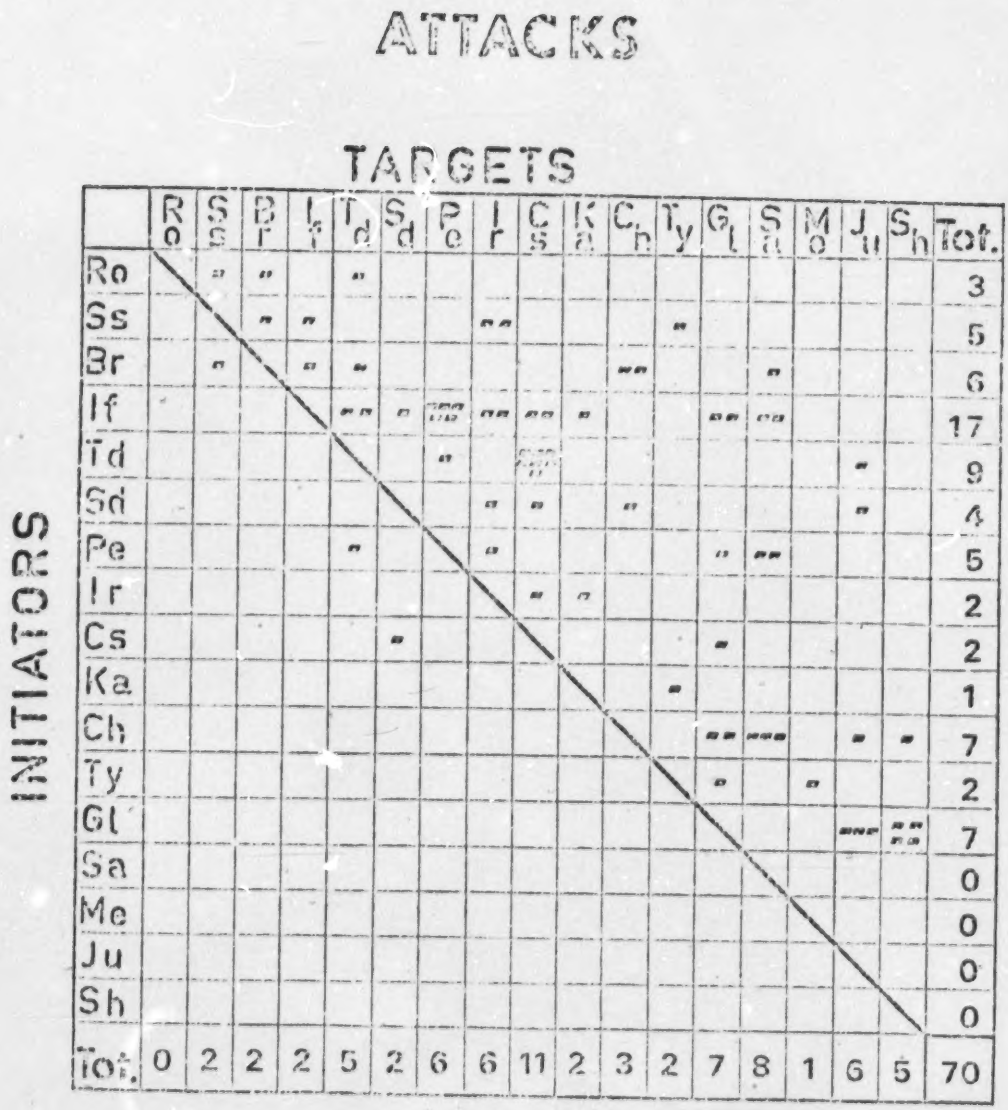
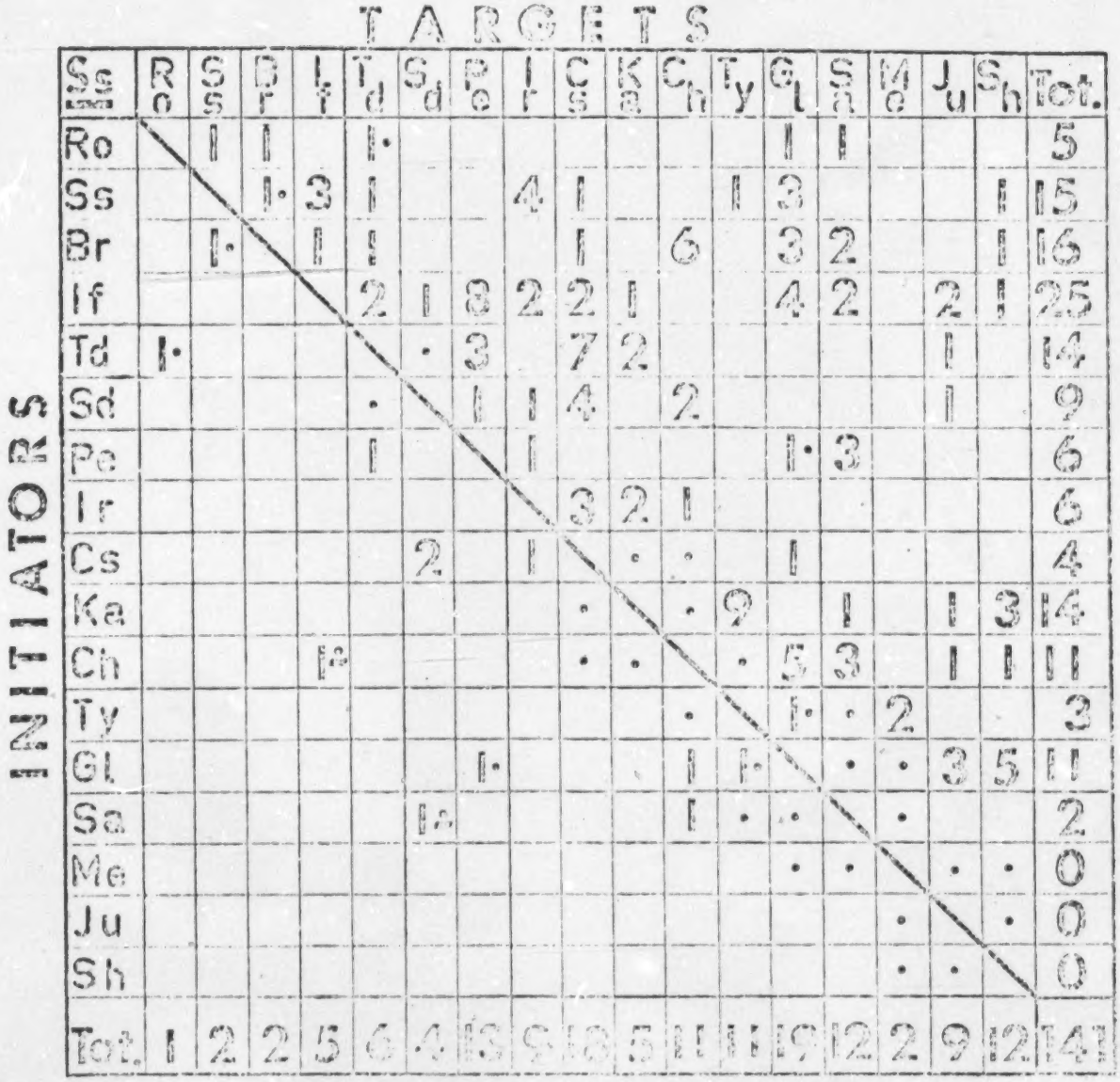

ATTACKS
TARGETS
INITIATORS
Ro Ss Br If Td Sd Pe Ir Cs Ka Ch Ty Gl Sa Me Ju Sh Tot.
Ro 3
Ss 5
Br 6
If 17
Td 9
Sd 4
Pe 5
Ir 2
Cs 2
Ka 1
Ch 7
Ty 2
Gl 7
Sa 0
Me 0
Ju 0
Sh 0
Tot. 0 2 2 2 5 2 6 6 11 2 3 2 7 8 1 6 5 70

Figure 7

DOMINANCE STRUCTURE



∴ = DYADIC REVERSAL
∘ = DYADIC TIE